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Accumulations of Bones of Lagopus in Late Pleistocene Sediments. Are they Caused by Man or Animals?

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SUMMARY
This paper examines sites with bones identified as *Lagopus* (willow grouse and/ or ptarmigan), medium-sized species of *Galliformes*, which occur in Central Europe since the Middle Pleistocene. The number of sites and the amount of material recovered increases dramatically in the Late Pleistocene, particularly in association with Magdalenian sites.
These large accumulations of *Lagopus* bones have been interpreted as evidence for intensive hunting of this species by man. This can however only be proven conclusively by the presence of cut marks and traces of burning. These are, however, almost never present.
Using the example of the Kartstein site (Ahrensburgian) in the Rhineland, this paper shows that the recovered spectrum of skeletal parts of *Lagopus* allows the distinction whether such bone accumulations are the result of hunting by man or predation by raptors, such as e.g. the snowy owl.

SAMENVATTING
Uit fossiele overblijfselen blijkt dat *Lagopus* (de moerassneeuwhoen en/of sneeuwhoen) een middelgrote hoenderachtige (Galliformes) in Centraal Europa sinds het Midden Pleistoceen voorkomt. Met name uit het Laat Pleistoceen zijn er vele locaties bekend met grote hoeveelheden overblijfselen vooral in Magdalenien vindplaatsen. Deze omvangrijke accumulaties van *Lagopus*-botten werden gezien als bewijs voor een intensieve jacht op deze dieren door de mens. Een bewijs hiervoor kan alleen geleverd worden als er snijsporen of verbrandingssporen aanwezig zijn En deze zijn echter bijna altijd afwezig.
De duitse vindplaats Kartstein (met een Ahrensburgkultuur) heeft een omvangrijke collectie *Lagopus*-botten opgeleverd. De samenstelling van de collectie beenderen toont aan dat de accumulatie niet alleen het resultaat is van de jacht door de mens maar dat blijkbaar ook roofvogels, zoals de aanwezige sneeuwuil, voor deze concentratie van beenderen verantwoordelijk zijn.

Even by the beginning of Palaeolithic research, accumulations of bones of small mammals and *Lagopus* had been discovered in many Late Pleistocene sediments in the Central European uplands and in neighbouring regions (e.g. KOKEN, 1912; HESCHELER & KUHN, 1949, p.257). The interpretation of these finds is contradictory. The bones of the small mammals are regarded as remains from pellets of birds of prey, whereas the accumulations of bones of *Lagopus* are considered as being caused by man (WENIGER, 1982, pp.80). This problem will be discussed in more detail in the following article.

The point at issue is not whether man in the Upper and Final Palaeolithic periods was able to hunt *Lagopus* (this is taken for granted), or how he made use of this prey apart from as food, but to what extent one can draw conclusions about human hunting activities from the accumulations of thousands of *Lagopus* bones.

Species of *Lagopus*

In the Pleistocene there already existed two different species of *Lagopus* (fig. 1) a species adapted to living on the ground. These are firstly the willow grouse (*Lagopus lagopus lagopus*), represented in the British Isles by the sub species red grouse (*Lagopus lagopus scoticus*), and secondly the ptarmigan (*Lagopus mutus*).

Nowadays both species have a northern circumpolar distribution, with the willow grouse also living in more southern regions. The ptarmigan is a little smaller than the willow grouse and can be identified very precisely by the morphology of the tarsometatarsus which is definitely smaller than that of the latter species (BOESSNECK & VON DEN DRIESCH, 1973, p.37 f.). In Pleistocene sediments of Central Europe both species are found.

Fossil Occurrence in Central Europe

The oldest specimens of *Lagopus* to be found come from the (late) Middle Pleistocene of the "Stránská skálá" near Brno in Moravia (CSFR; JÁNOSSY, 1971), and from the collapsed cave ruins of "Hunas" near Nuremberg in Bavaria (JÁNOSSY, 1983). Evidence from the late

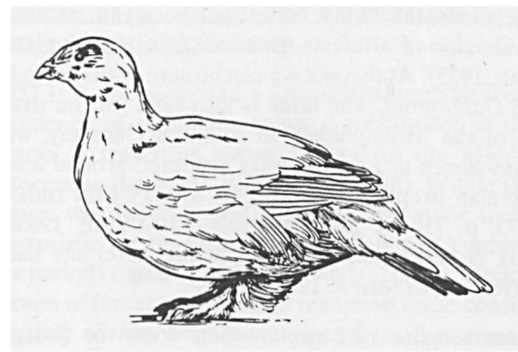

Fig. 1: Drawing of *Lagopus* (Adapted from: H.Müller-Beck (Ed.), 1983: Urgeschichte in Baden-Württemberg, Stuttgart).
Fig. 1: Tekening van *Lagopus* (naar: H. Müller-Beck, 1983.)

Middle Palaeolithic is known from the first part of the last glacial period, e.g. for the Bockstein-"Brandplatte" in the Lone Valley (LEHMANN, 1969), as well as from the Weinberg Caves near Mauern, both in South Germany (VON KOENIGSWALD, 1974). In the Upper Palaeolithic the evidence for *Lagopus* becomes clearly more abundant. In some regions *Lagopus* now becomes the most characteristic species for the late Upper Palaeolithic (especially the Magdalenian). *Lagopus* can also be found in various contexts in the Final Palaeolithic e.g. on Ahrensburgian sites (see below).

The fact that *Lagopus* can also be found in Mesolithic contexts dating back into the Boreal, in the "Grotte du Coléoptère" in Belgium, is interesting, for it eventually furnishes proof that an open biotope persisted into the Preboreal and the Boreal in this region (MOURER-CHAUVIRÉ, 1983a).

Hunting of birds, in particular *Lagopus*, by man in the Pleistocene

The only proof for the hunting of birds by man in the Palaeolithic that can be accepted as certain are traces of cutting and burning on the bones of the birds. However this occurs very rarely and is mostly found at Upper Palaeolithic sites. Other kinds of utilization, which may leave no traces on the bones, provide no definite archaeological proof for the hunting of birds. In the Stratum D2 (Late Upper Palaeolithic) of the "Kephalari-Cave" in the Argolid (Greece) cutmarks have regularly been discovered on bones of the rock partridge (*Alectoris graeca*), a close relative of *Lagopus* (REISCH, 1976). In the majority of cases they are on the distal diaphyses of the tibiotarsus and are interpreted as proof of the processing of the feathers, after the birds had been hunted by man. Theoretically man could have also utilized birds which had died naturally, which makes the automatic equation of cutmarks with proof of hunting of the birds questionable.

Bones of *Galliformes* with both cutmarks and traces of burning have been found in the Magdalenian layer of the "Grotte de Romain" near Pierre Châtel/ Ain (France), where the larger bones had been utilized for the production of artefacts (DESBROSSE & MOURER-CHAUVIRÉ, 1973). At this site we can be sure of that man hunted *Galliformes*. The same is also valid for the stratum IV of the "Brillenhöhle" in southern Germany, where many bones of *Lagopus* were scattered around a Magdalenian fireplace (BOESSNECK &. VON DEN DRIESCH, 1973, p. 73; see also: MOURER- CHAUVIRÉ, 1983b, p. 121). Nevertheless, the bones at this latter site had no cutmarks (WENIGER, 1982, p. 80).

Some remains of *Lagopus* come from the Swiss site "Hollenberghöhle 3", near Arlesheim. The investigator considers that their presence at the site is due to man, although it was not possible to find any cutmarks or traces of burning on them. It is suggested in support of this interpretation that, in view of the inaccessibility of the cave, man probably brought only the bigger animals to his place of settlement, *Lagopus* being one of them (KAUFMANN, 1982, p. 72). Nevertheless this argument remains speculative, because positive evidence for man's role are missing and other alternatives can be suggested (see below).

Depictions of *Galliformes*, e.g. an engraving of *Lagopus* on a slate plaque in Gönnersdorf, Rhineland (BOSINSKI, 1981, p. 105) are for H. LÖHR (1985, p. 279) reason to believe in the hunting of those animals by man. But in Palaeolithic art animals are often portrayed which certainly played only a small part in the diet or were not hunted at all.

This short survey already shows that unequivocal evidence for hunting of *Lagopus* or other *Galliformes* is very rare. That it is nevertheless often uncritically accepted is probably due to the fact that the impressive numbers of remains of these birds often found associated with an archaeological layer are regarded as demonstrating a former rich potential, and hence certainly exploited, source of food.

Introduction to the site by birds of prey

In caves and rockshelters of the late Pleistocene in the upland region of Europe, especially in Southern Germany, remains of *Lagopus* are commonly associated in sediments with a rich fauna of small mammals. This is due to the accumulation of pellets by raptors and owls which used the prominent rock formations as a roosting and nesting place. The accumulations of bones of *Lagopus* could therefore be caused by birds of prey, since certain species, such as the snowy owl *(Nyctea scandiaca)*, which are frequently found in Pleistocene sediments take *Lagopus* as a "preferred substitute food" instead of the "usual" lemmings and voles (GLUTZ VON BLOTZHEIM, 1980, p.384).

W. von Koenigswald suggests this as an explanation for the rodent stratum "Nagerschicht" from the "Kleine Scheuer" in the Lone Valley in South Germany (HAHN & VON KOENIGSWALD, 1977, p. 65). If such a place is used by man - even for a short time - during this natural phase of accumulation, the bones of *Lagopus* recovered by excavation could be easily interpreted as a result of human hunting, despite the absence of cutmarks or traces of burning. There follows a description of a solution to this problem, which will be demonstrated by a situation examined by the author.

Minimum numbers of specific parts of the skeleton

A first approach to a solution is provided by the examination of sediments containing rodents, which have certainly been formed only by the accumulation of bird pellets without human invovement e.g. from karstic fissures. By an examination of such sites C. MOURER-CHAUVIRÉ (1983b) could demonstrate that in these si-

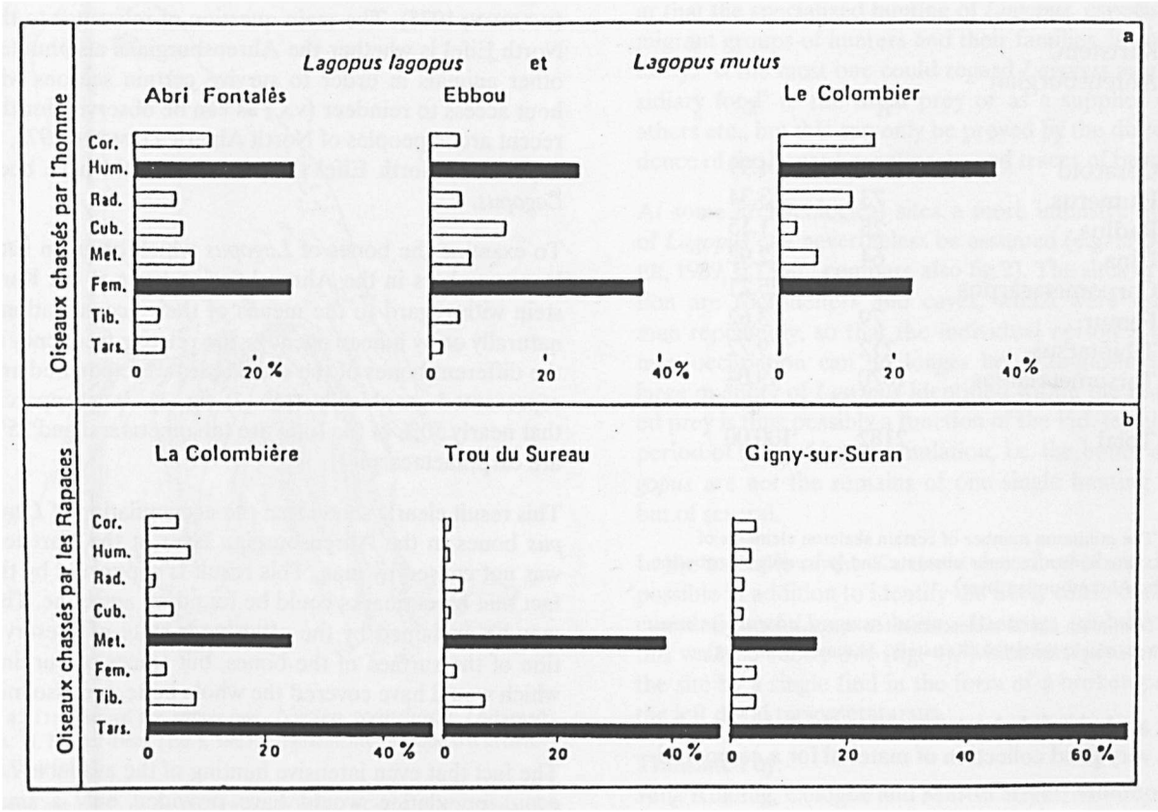

Fig. 2: Percentile distribution of skeleton-elements of *Lagopus*: a) Sites, in which the hunting of *Lagopus* by man could be proved b) Sites, in which *Lagopus*-bones had been spilled out by birds of prey (changed accordingly to MOURER-CHAUVIRÉ 1983b, Fig. 1).

Fig. 2: Procentuele verdeling van skeletelementen van *Lagopus*. a: Vindplaatsen waar jacht door de mens op *Lagopus* bewezen kan worden. b) Vindplaatsen waar *Lagopus*-botten verspreid zijn door roofvogels (naar: MOURER-CHAUVIRÉ, 1983b, Fig. 1).

tuations the bone of the distal extremities (tarsometatarsus, carpometacarpus) of medium-sized *Galliformes* (thus also *Lagopus)* are clearly overrrepresented by comparison with the proximal extremities (femur, humerus).

The exact opposite is the case when the presence of cutmarks or burning demonstrate that the birds are to be interpreted as the prey of man, as is for example the case at the "Abri Büttenloch", a Magdalenian station in Switzerland (kind information J. SEDLMEIER, 1989).

To illustrate this situation more clearly, the minimum number of extremity bones is shown in a block diagram according to their percentile distribution (fig. 2).

The essential precondition for this analytical approach is a sufficiently large collection of material. Even then one can not totally exclude the possibility that man is responsible for a small prportion of the *Galliformes* found in naturally originated accumulations. This should only be accepted on the evidence of unequivocal cutmarks and traces of burning on the bones.

The different combination of skeletal parts is based on the fact that birds of prey, such as owls, crush the meat bearing bones when they swallow the entire body of their prey, leaving mainly only unidentifiable splinters of the humerus and femur to be regurgitated and found in the sediments layer. These also subsequently weather more rapidly than the distal bones of the extremities, which are swallowed and regurgitated whole, and therefore accumulate in relatively larger numbers (MOURER-CHAUVIRÉ, 1983b, p. 114).

An example of the method: The Ahrensburgian layer, Kartstein, North Eifel, Germany

In 1977 H. Löhr excavated a Late-Pleistocene/Holocene sequence of sediments below a rockshelter at the Kartstein, a travertine massif formed in the Middle Pleistocene in the North Eifel (LÖHR, 1978). Within the sequence was found a stratum with a few stone tools, characteristic for the "Ahrensburger Kultur" (Younger Dryas period) together with many animal bones. Beside the bones of few species of large mammals these consisted mainly of very large quantities of small mammals and bones of *Lagopus* (BAALES, 1989a).

In an excavation area of approximately 30 m^2 were counted several thousands of bones of the latter species. Of this quantity some 3,000 specimens can be used

Kartstein, Ahrensburgian	n	%
Coracoid	109	4.99
Humerus	73	3.34
Radius	25	1.15
Ulna	64	2.93
Carpometacarpus	550	25.21
Femur	79	3.62
Tibiotarsus	212	9.72
Tarsometatarsus	1070	49.04
Total	2182	100.00

Table 1: The minimum number of certain skeleton elements of *Lagopus* are shown in their absolute and percentile distribution (Kartstein, Ahrensburgian layer).

Tabel 1: Mimimum aantal skeletelementen van *Lagopus* in absolute en procentuele aantallen (Kartstein, Ahrensburgian laag).

for the analysis of skeletal parts described above and so offer a very good collection of material for a comparative test.

Within the classic region of distribution of the Ahrensburg group the few sites with preserved organic material provide evidence that man had been hunting migrating herds of reindeer which occurred there seasonally (STURDY, 1975). The main question of relevance to the North Eifel is whether the Ahrensburgians also hunted other animals in order to survive certain seasons without access to reindeer (v.s.) as can be observed for the recent arctic peoples of North America (SMITH, 1978, p. 72). In the North Eifel this resource could have been *Lagopus*.

To examine the bones of *Lagopus* which occur in such large numbers in the Ahrensburgian layer at the Kartstein with regard to the means of their accumulation - naturally or by human agency - the relative frequency of the different bones of the extremities were counted and represented graphically (tab. 1; fig. 3). It is apparent that nearly 50% of the total are tarsometatarsi and 25% are carpometacarpi.

This result clearly shows that the accumulation of *Lagopus* bones in the Ahrensburgian layer at the Kartstein was not caused by man. This result is supported by the fact that no cutmarks could be found on any bone. This may be explained by the often poor state of preservation of the surface of the bones, but traces of burning, which would have covered the whole bone, are also missing.

The fact that even intensive hunting of the available *Lagopus* population would have provided only a small quantity of food for a small group of hunters and gatherers makes the theory of intensive hunting of *Lagopus* seem less likely (BAALES, 1989b). Moreover, intensive

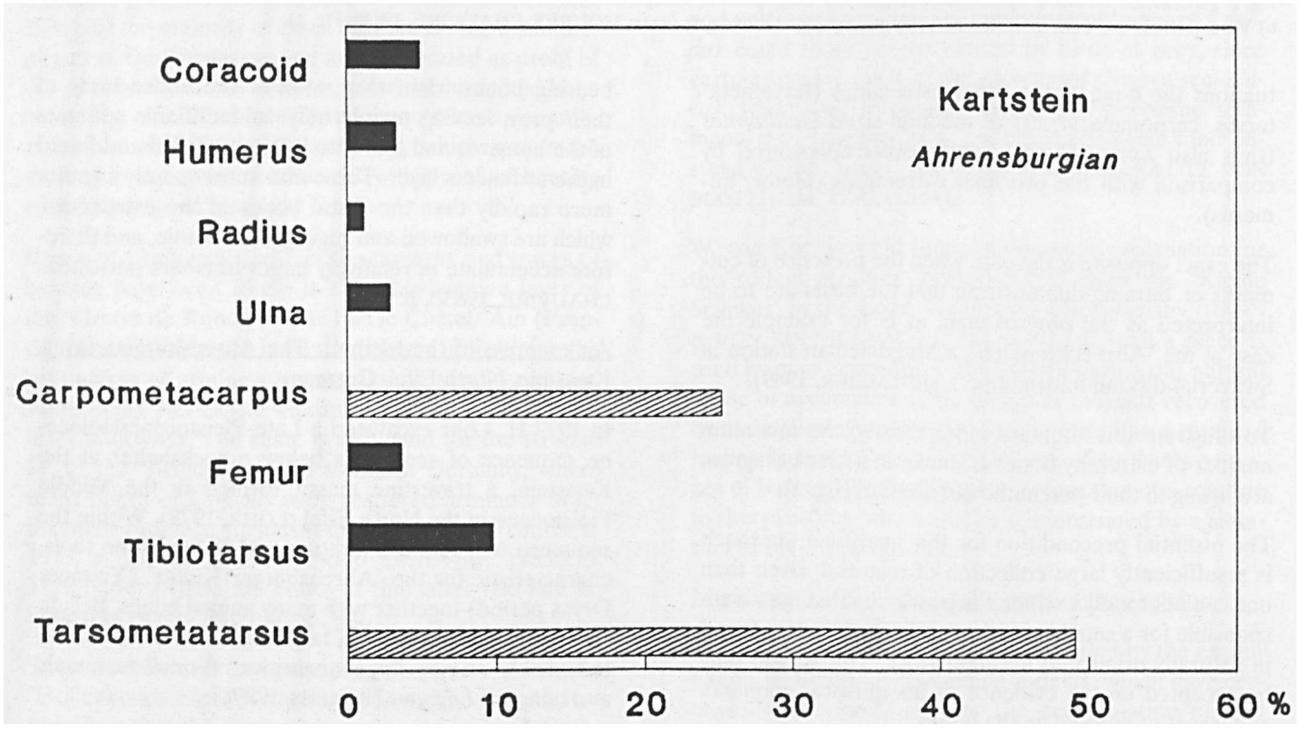

Fig. 3: The percentile distribution of the skeleton-elements of *Lagopus* at the Kartstein (Ahrensburgian layer).

Fig. 3: Procentuele veredeling van skeletelementen van *Lagopus* bij Kartstein (Ahrensbrugian laag).

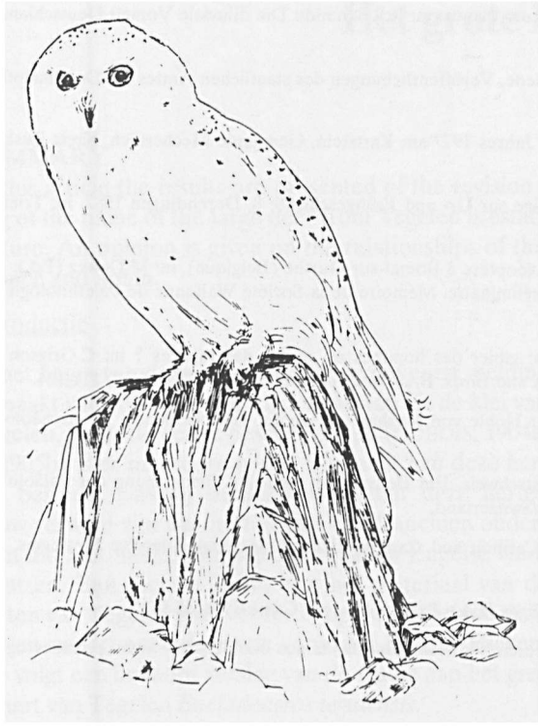

Fig. 4.: Drawing of the snowy-owl *Nyctea scandiaca* (Adapted from: H. Müller-Beck (Ed.), 1983: Urgeschichte in Baden-Württemberg, Stuttgart).

Fig. 4: Tekening van de sneeuwuil *Nyctea scandiaca* (naar: H. Müller-Beck, 1983).

hunting of *Lagopus* would have caused a rapid reduction of the population, and would also have presupposed a very patient and time-wasting hunting strategy. Populations of *Lagopus* consist normally of 40-50 individuals, in some rare cases reaching 100 individuals. Moreover, when startled, their escape-flight covers some 35 m, although is noticeably less during the incubation period (WENIGER, 1982, p. 82). All those facts make clear that the specialized hunting of *Lagopus,* especially by migrant groups of hunters and their families, is not very likely. At the most one could regard *Lagopus* as a "subsidiary food" to the usual prey or as a supplier of feathers etc., but this can only be proved by the direct evidence of the bones i.e. cutmarks and traces of burning.

At some archaeological sites a more intensive hunting of *Lagopus* can nevertheless be assumed (e.g. SEDLMEIER, 1989, p.133ff.; compare also fig.2). The sites in question are rockshelters and caves, which were used by man repeatedly, so that the individual episodes of human occupation can no longer be distinguished. The large quantity of *Lagopus* identified within the recovered prey is thus possibly a function of the indeterminable period of time of its accumulation, i.e. the bones of *Lagopus* are not the remains of one single hunting event but of several.

In the example of the Kartstein described above it was possible in addition to identify the likely cause of the accumulation of *Lagopus* bones. It seems probable that this was the snowy owl (fig. 4), which is represented at the site by a single find in the form of a broken part of the left distal tarsometatarsus.

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